Small Business Innovation Research/Small Business Tech Transfer

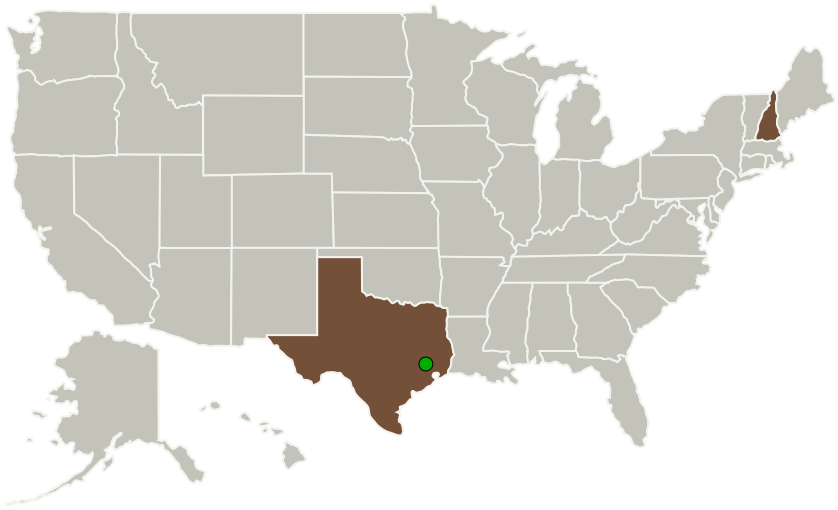
Space Evaporator Absorber Radiator (SEAR) for Thermal Storage on Manned Spacecraft, Phase I

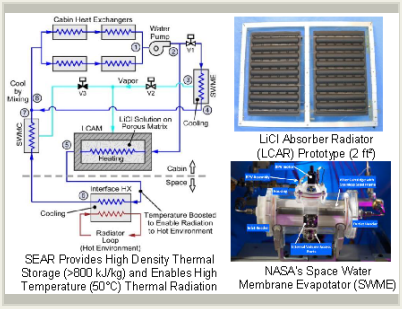
Completed Technology Project (2014 - 2014)

Project Introduction

Future manned exploration spacecraft will need to operate in challenging thermal environments. State-of-the-art technology for active thermal control relies on sublimating water ice and venting the vapor overboard in very hot environments. This approach can lead to large loss of water and a significant mass penalty for the spacecraft. We propose to develop a Space Evaporator Absorber Radiator (SEAR) that uses heat pumping and energy storage by LiCl/water absorption to enable thermal control without venting water even in the most adverse thermal conditions. The LiCl absorber technology has the potential to absorb over 800 kJ per kg of system mass, compared to phase change heat sink systems that typically achieve ~50 kJ/kg. Successful, subscale tests have already shown the potential for significant mass savings and radiator size reduction. We propose to develop an experimental package that will enable SEAR testing on ISS. In Phase I we will prove feasibility by assessing thermal environments for future exploration spacecraft, designing the thermal control system, and producing a conceptual design for an ISS test package. In Phase II we will design, build, and test a prototype experimental package suitable for demonstrating SEAR performance in an ISS internal rack.

Primary U.S. Work Locations and Key Partners





Space Evaporator Absorber Radiator (SEAR) for Thermal Storage on Manned Spacecraft Project Image

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Organizations Performing Work	Role	Type	Location
Creare LLC	Lead Organization	Industry	Hanover, New Hampshire
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
New Hampshire	Texas

Project Transitions

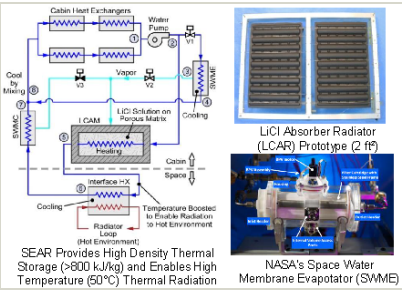
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137779)*

Images



Project Image
Space Evaporator Absorber Radiator (SEAR) for Thermal Storage on Manned Spacecraft Project Image
(https://techport.nasa.gov/image/130912)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Creare LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

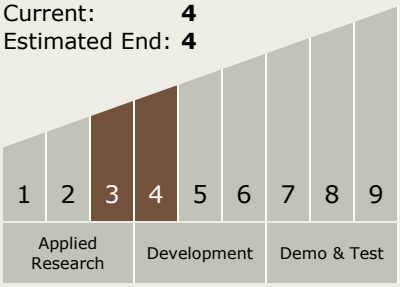
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Michael G Izenson

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.3 Heat Rejection and Storage

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System